

Decadal Changes on the Greenland Ice Sheet Observed by Microwave Radar

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Microwave spaceborne scatterometers can be used effectively to study recent changes in the Greenland ice sheet. New imaging techniques facilitate the use of historic and contemporary scatterometer data to investigate decadal climate change. We use data from NASA's Ku-band scatterometer (NSCAT), the C-band European Space Agency's ERS-1/2 AMI (EScat) and the NASA Seasat (SASS) scatterometer to study the backscattering characteristics of the Greenland ice sheet between 1978 and the present day. Key zones of snow and ice 'facies' are clearly delineated on the basis of the radar backscattering cross-section together with their seasonal changes. Comparisons between Ku-band seasonal backscatter characteristics in SASS and NSCAT data enable detection of 18-year changes in the location and extent of the dry-snow zone. Results show a clear reduction in its extent since 1978, with the largest changes occurring in the south western part of the ice sheet. These changes are consistent with the decadal warming trend and increase of more than 1.0°C between 1979 and the present. Other results suggest that these data may be used for extracting dry-snow zone accumulation rates.

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